

Biogas enhancement through a TPAD carried out on primary sludge

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The pre-treatments of different nature (mechanical, thermal, chemical, biological) introduced in the sludge line of wastewater treatment plants (WWTPs) have the purpose of promoting hydrolysis, especially for waste activated sludge (WAS), in order to increase the overall degradation kinetics and, in the case of anaerobic digestion, biogas production. Full scale application of mechanical (high pressure) and thermal ($> 100\text{ }^{\circ}\text{C}$) pre-treatments are commonly found for the sludge treatment processes (Carrere et al., 2016). At the same time, research and industry are increasingly interested in the production of volatile fatty acids (VFAs), that have a great potential in bio-energy production and as a carbon source in the biological nutrient removal (BNR) in wastewater treatment systems (Crutchik et al., 2018).

The aim of this work is to investigate the effect of a temperature phased anaerobic digestion (TPAD), carried out on primary sludge, on the generation of sCOD. TPAD uses a 2-day $50\text{ }^{\circ}\text{C}$ pre-treatment step prior to $38\text{ }^{\circ}\text{C}$ digestion in the main stage (20 days). The first step configuration favors methanogenic bacteria washout and the system acidification. The experimental setup (Figure 1) is composed of two 10 L pilot digesters working in semi continuous mode. The biologically treated digestate fed the second anaerobic digester working in mesophilic condition with an HRT of 20 days. Furthermore, this study evaluates the efficiency of the first stage biological pre-treatment in terms of sCOD release and in terms of biogas production increase analyzed in the second stage anaerobic digestion. The data obtained are used for a technical and economic feasibility assessment.

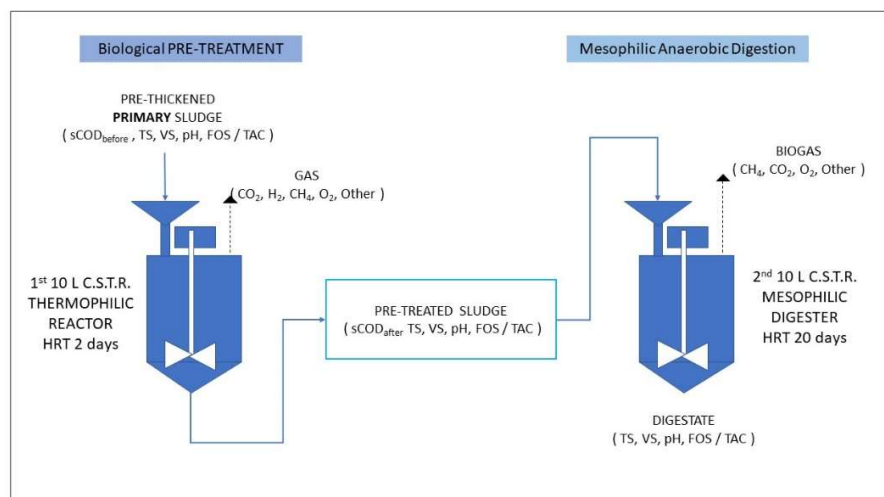


Figure 1 Set up of the tests

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